PROCEEDINGS OF THE BIOLOGICAL SOCIETY OF WASHINGTON
112(4):687–694. 1999.

The freshwater centropagid *Osphranticum labronectum* Forbes, 1882 (Crustacea: Copepoda: Calanoida) in Mexico with description of a new subspecies

M. A. Gutiérrez-Aguirre & E. Suárez-Morales

El Colegio de la Frontera Sur (ECOSUR), A.P. 424, Chetumal, Quintana Roo 77000, Mexico

Abstract.—From a zooplankton survey carried out during January 1998 in several ponds of the Mexican state of Tabasco, southern Gulf of Mexico, several specimens of the freshwater centropagid copepod *Osphranticum labronectum* Forbes, 1882 were collected. This is a widespread species in North America. There is a single record south of 25°N, in Guatemala (ca. 15°N). The species has not been reported from the large area lying between these records, mostly represented by Mexico. This finding in southeast Mexico is helpful to understand the distributional range of the species. It is also the first record of a freshwater species of the Centropagidae for Mexico. The Mexican specimens show morphological differences when compared with previously described material, mainly on the armature of male and female fifth legs, and in their size. These differences, and the assumed isolation of the Mexican populations from the species main distribution area in the Nearctic region, suggest that the Mexican population is a new subspecies, *O. labronectum mexicanum.* Taxonomic illustrations, including structures not depicted or described before for the species, are also provided herein.

The calanoid copepod family Centropagidae is represented in the Americas by six freshwater genera (*Parabroteas* Mrázek, 1901; *Limnocalanus* Sars, 1863; *Osphranticum* Forbes, 1882; *Boeckella* De Guerne & Richard, 1889; *Neoboeckella* Bayly, 1992a; *Sinodiaptomus* Kiefer, 1932). The genus *Pseudoboeckella* Mrázek, 1901 is now considered a synonym of *Boeckella* (Bayly, 1992b). However, only *Limnocalanus, Sinodiaptomus,* and *Osphranticum* are known to be distributed in North America (Williamson 1991, Bayly 1992a, Reid & Pinto-Coelho 1994).

Osphranticum labronectum, the only species of this genus, is one of the most widely distributed freshwater centropagids in the United States and Canada (Wilson & Yeatman 1959, Williamson 1991). This species was described originally by Forbes (1882) from material collected in Lake Michigan. It is mainly a Nearctic copepod, reported from several localities of the United States and Canada (Marsh 1933; Wilson & Yeatman 1959; Dussart & Defaye 1983, 1985; Bayly 1992a). Its southernmost record in North America is in the Everglades, Florida (Reid 1992). South of this, there is one record from Guatemala (Juday 1915, Reid 1990) which was overlooked by Fernando & Smith (1982) in their revision of the Central America freshwater copepod fauna.

From a zooplankton survey carried out to investigate the copepod diversity of freshwater environments of the state of Tabasco, southeastern Mexico, several specimens of this copepod were recorded. A geographic record of this species is presented along with illustrations of the material examined, and the description of a new subspecies, *O. labronectum mexicanum.*

Zooplankton was collected 12 January

1998, during a survey of several aquatic environments in the state of Tabasco, southeastern Mexico. Samples were collected using a standard plankton net with a 0.072 mm mesh, deployed in near–shore plankton trawls. The zooplankton specimens were fixed in 4% formalin, and then processed for identification. The taxonomically relevant structures for the identification of these copepods, and those not previously depicted were illustrated with the aid of a camera lucida. Descriptions are provided of the cephalic appendages. Specimens were deposited in the collection of the National Museum of Natural History (USNM), Washington, D.C., in the the Muséum National d' Histoire Naturelle (MNHN), and in the zooplankton collection of El Colegio de la Frontera Sur, Chetumal (ECO-CHZOO).

Family Centropagidae

Osphranticum labronectum Forbes, 1882

O. labronectum mexicanum, new subspecies

Figs. 1–13

Material examined.—Holotype: One adult female, ethanol-preserved. Laguna Matillas, Tabasco, Mexico, 12 Jan. 1998, USNM 288458. Paratypes: Six adult females from same site, deposited in MNHN-Cp1777. One adult male in the same institution (MNHN-Cp1776). One adult female and three adult males from same locality, 12 Jan 1998, ethanol-preserved, access number ECOCH-ZOO-00463. Two adult males from same locality, USNM 288459.

Type locality.—Laguna Matillas, Tabasco, southeastern Mexico: 17°53′45.8″N, 92°31′19.6″W, 12 Jan 1998. Environmental conditions of the sampling site associated with this record were: temperature: 27.7°C; pH: 6.32; oxygen: 7.2 ppt.

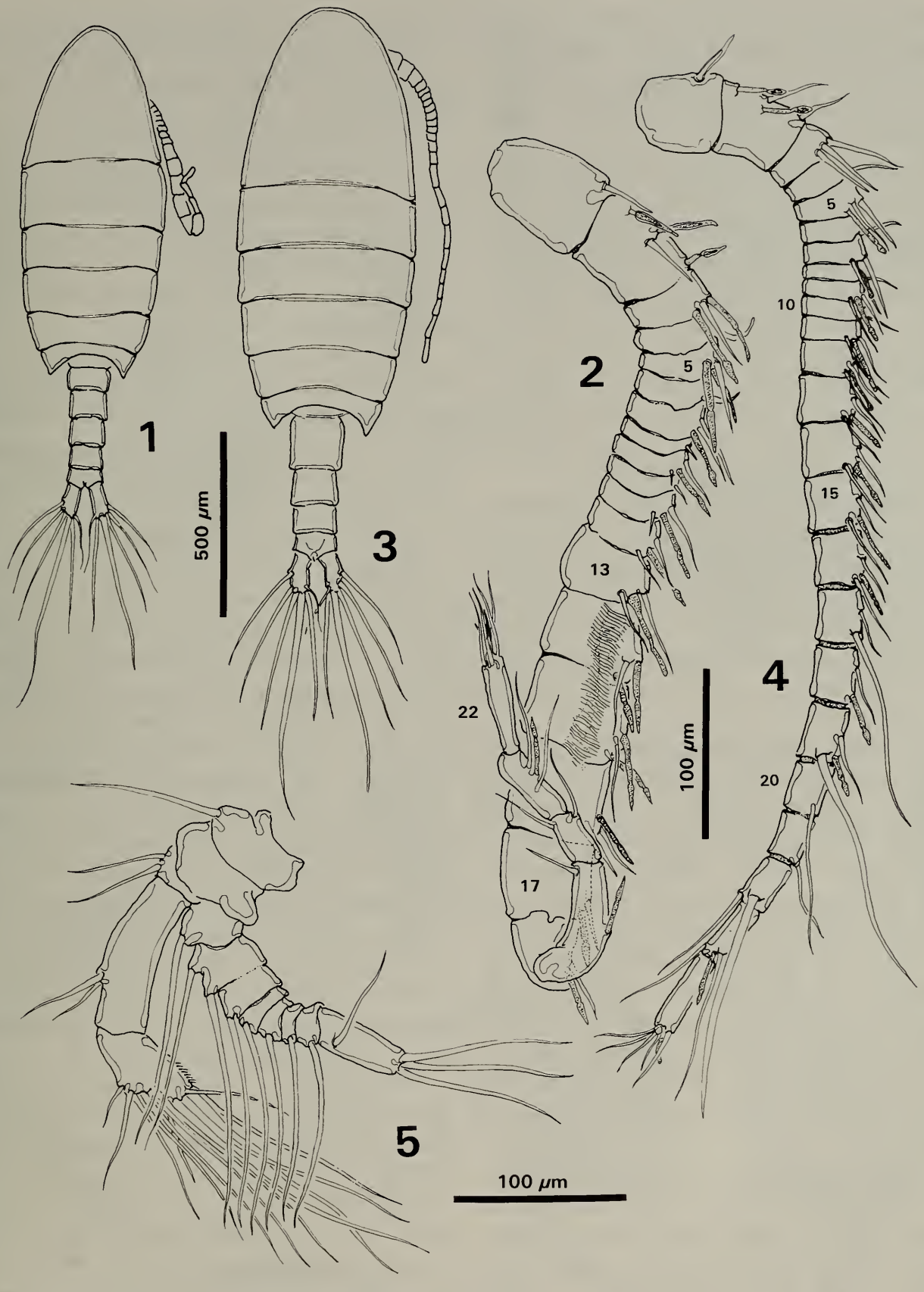
General description.—Body shape and proportions as described and depicted by Marsh (1933) and Dussart & Defaye (1995). Average length (n = 5) of females: 1.44 mm, cephalothorax 0.97 mm long, 0.15 mm wide. Antennule length 1.06 mm. Genital somite 0.14 mm long, 0.15 mm wide. Average length (n = 5) of males: 1.26 mm, cephalothorax 0.85 mm long, 0.34 mm wide. Antennules 0.79 mm. Genital somite 0.07 mm long, 0.09 mm wide.

Description of cephalic appendages.—Female: Antennules (Fig. 4) relatively short, 24-segmented, reaching posterior margin of third pediger (Fig. 3), longer in some specimens. Spiniform seta on first segment long, stout. Long setae on segments 17, 19, and 22. Appendages per segment as follows (numerals = segment, numerals between brackets = number of setae, ae = aesthetasc, sp = spine): 1(sp), 2(2+2ae), 3(3), 4(1), 5(2+ae), 6(1), 7(2+ae), 8(1), 9(2+ae), 10(1), 11–16(2+ae), 17(2), 18(1+ae), 19(2+ae), 20(1), 21(1), 22(2), 23(2+ae), 24(5+ae) (Fig. 4).

Male: Antennules 22-segmented, left antennule as in female, right antennule (Fig. 2) geniculated between segments 18–19, segments 13–17 relatively wider. Strong muscular striation on segments 14 and 15. Appendages per segment as follows: 1(sp), 2(1+3ae), 3(1+2ae), 4(1), 5(1+2ae), 6(1), 7(2+ae), 8(1), 9(2+ae), 10(1), 11–13(2+ae), 14 and 15(1+2ae), 16(2+ae), 17 and 18(1+ae), 19(1+ae), 20(2), 21(2+ae), 22(5+ae).

Antennae with exopod longer than endopod (Fig. 5). Coxa with one long seta. Basis wide, with two subequal setae on outer distal margin. Endopod with two segments, proximal with two setae on distal 1/3. Distal portion of terminal endopodal segment with two lobes, internal with row of hairlike spinules, with five setae, one smaller than others. External lobe with one short and seven long setae. Exopod 8-segmented, with one seta on first segment, two on second, and one seta each on segments 3–7. Distal segment with one short seta on proximal 1/3, and three long terminal subequal setae.

Mandible (Fig. 6) with seven bluntly-pointed teeth on gnathobase and a movable tooth at the tip. Basis with three setae; endopod of two segments, proximal segment



Figs. 1–5. *Osphranticum labronectum mexicanum.* Adult male, Laguna Matillas, Tabasco, Mexico: 1, Habitus, dorsal; 2, right antennule; Adult female. 3, habitus, dorsal view; 4, right antennule; 5, antenna.

with four setae on distal portion of outer margin; distal segment slightly longer, with 7 subequal terminal setae plus one posterior seta. Exopod 5-segmented, with a 1,1,1,1,2 setation pattern.

Maxillule (Fig. 7) with praecoxal arthrite with 15 spiniform setae, two anterior, nine terminal, four posterior. Coxal epipodite with nine setae, inner two smaller and thinner than the others, coxal endite with four setae. Basis with one internal lobe bearing four setae, basal exite with one seta. Basal endite with five setae. Endopod 3-segmented, articulating with basis, setation pattern as: 4,4,7. Exopod with 12 setae, three of five proximalmost larger, plumose.

Maxilla (Fig. 8) indistinctly segmented, with two praecoxal and two coxal lobes, and a well developed basal lobe. Setation pattern of five lobes as: 4, 3 (first and second praecoxal endites), 3, 3 (first and second coxal endites), 3 (basal endite); endopod 4-segmented, with setation pattern: 1,1,2,3.

Maxilliped (Fig. 9) well developed. Coxa fused with praecoxa, with anterior protuberance projecting over next segment, with row of short spinules surrounding process. Coxa with 3 distinct lobes, proximalmost low, with two setae, second with three, third with four. Basis with group of three setae on middle of inner margin. Endopod 6-segmented, with first segment partially fused to basis, bearing two subequal setae. Second and third endopodal segments with four subequal setae, fourth with three, fifth with four; terminal segment with four subequal setae.

Caudal rami (Fig. 10) structure and proportions as described and depicted by Marsh (1933), furcal seta relatively long, length of ramus/setal length ratio: 1.75. Other caudal seta as depicted by Marsh (1933).

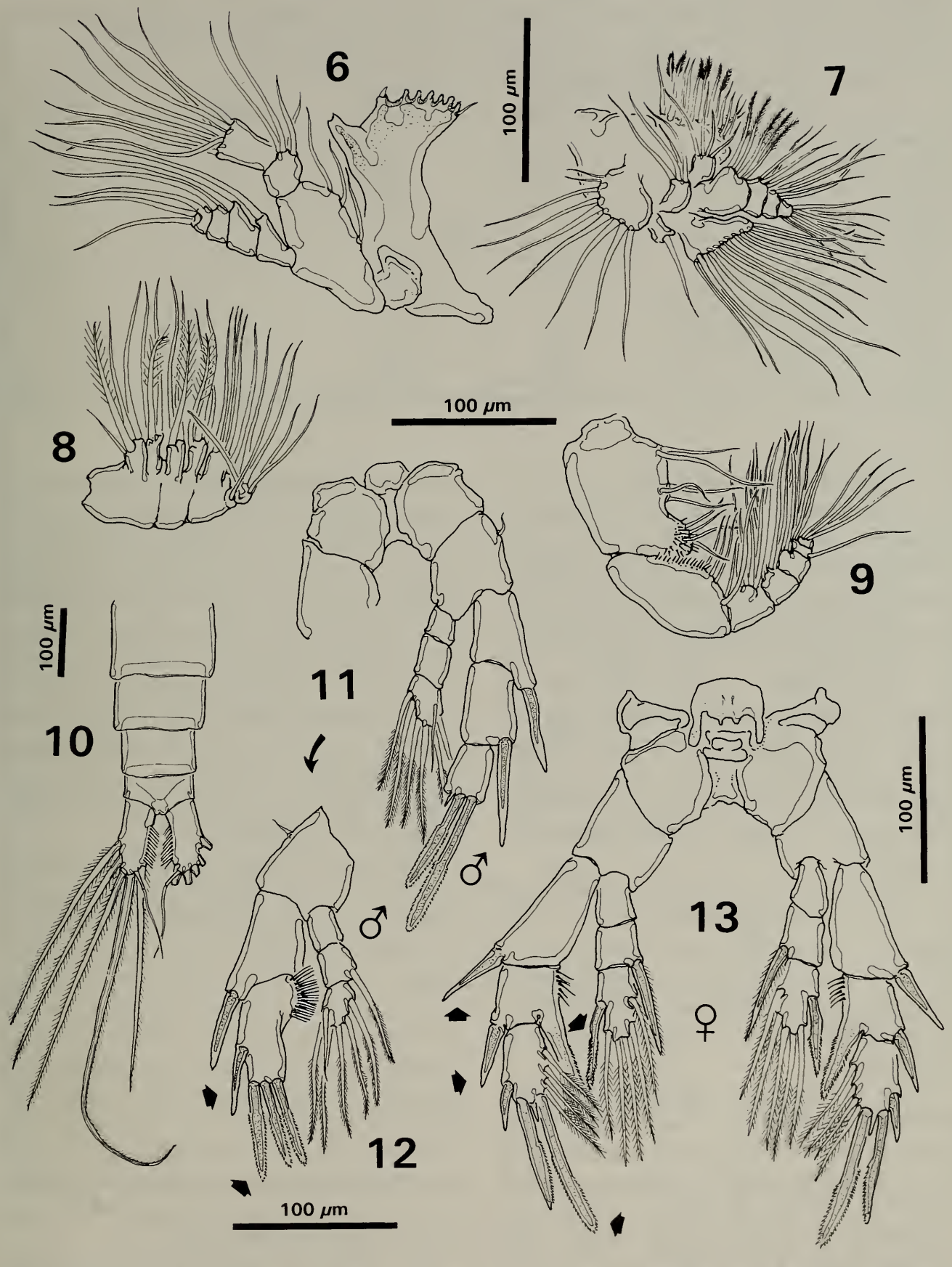
Male fifth legs (Figs. 11, 12).—As described by Marsh (1933), Bayly (1992a), and Dussart & Defaye (1995). Relative length ratios of lateral spine on terminal exopodal segment, and of the outermost terminal spine of same segment as presented in Table 1. Inner rounded protuberance on terminal exopodal segment relatively low and not pronounced.

Female fifth legs (Fig. 13).—As described by Marsh (1933), Bayly (1992a), and Dussart & Defaye (1995) but differs in the relative length of the spines on first and second exopodal segments, the innermost apical spine, and the spine on third endopodal segment (see Table 1).

Etymology.—The subspecific epithet refers to the country in which the specimens were collected and for which they represent the first record of a freshwater centropagid. The gender of the genus and species names is neuter, and so is the corresponding Latin form used on the subspecies name.

Remarks.—The species can be readily distinguished from most genera of freshwater Centropagidae by having, in the fifth legs, 3-segmented endopodites on both sides in males and females. Additionally, the male left distal exopodal segment has an inner rounded protuberance at its base (Fig. 12). The caudal rami in both sexes are less than 2.5 times as long as maximum width (Wilson & Yeatman 1959, Bayly 1992a). The right caudal ramus has the second inner terminal seta clearly wider and longer than the others (Williamson 1991). Several structures, including the antennules, antennae, and mouthparts (Figs. 2, 4–9) are illustrated here; some of these appendages have not been depicted before.

We detected some differences in the Mexican specimens with respect to the illustrations of the species by Marsh (1933), Wilson & Yeatman (1959), Dussart & Defaye (1995), and Bayly (1992a), all from material of the Nearctic region. The relative length of the spines of both the female and male fifth legs are different in both groups of specimens (see arrowed spines on Figs. 12, 13), as shown in Table 1. The antennule relative length is 70.8% of the total body length and 89.5% of the cephalothorax length in Wilson & Yeatman (1959, fig. 20.29). It is 63.5%, and 85.7%, respective-



Figs. 6–13. *Osphranticum labronectum mexicanum.* Adult female, Laguna Matillas, Tabasco, Mexico: 6, mandible; 7, maxilla; 8, maxillule; 9, maxilliped; 10, urosome, dorsal view; 11, male right fifth leg; 12, male left fifth leg; 13, female fifth leg.

Table 1.—Comparison of length ratios of some morphological features described for *Osphranticum labronectum* in the Nearctic region, and *O. labronectum mexicanum* from Tabasco, Mexico. P5 = fifth leg.

Features	Wilson & Yeatman (1959)	Dussart & Defaye (1995)	Marsh (1993)	Specimens from Tabasco
Female P_5: Re 1 spine/Re2	0.87	0.77	0.85	1.37
Female P_5: Re 2 outer spine/Re 2	0.78	0.74	0.69	1.11
Female P_5 : apical inner spine/Re 3	1.87	1.26	1.78	2.1
Female P_5 : spine on Ri 3/Ri 3	1.0	0.83	0.6	1.23
Female furca : dorsal seta/furcal ramus	0.40	0.75	0.41	1.75
Male P_5 Re 2 lateral spine/Re 2	0.53	0.52	0.56	0.68
Male P_5 Re: apical outer spine/apical medial and inner spines	1	1	1	1.15
Male P_5 Re : process on inner margin	high, pronounced	high, pronounced	high, pronounced	low, not pronounced

ly, in Dussart & Defaye (1995, fig. L7). Although relatively shorter in the figure by Dussart & Defaye (1995), in both, antennules do not reach beyond the posterior margin of the fourth pediger. In our specimens the corresponding relative lengths are ca. 67% (60–73.9%), and ca. 95% (78.9–more than 100%). Antennules are relatively longer in our specimens, reaching at least the posterior margin of the third pediger, but in some they reach the second urosomite. However, the variability of this character seems to make it taxonomically unimportant.

The dorsal furcal setae are much longer in the Tabasco specimens (1.6–1.7 the length of the furcal rami versus 0.4–0.7) than in the North American material. This character is not as variable as the antennule length and could be used to recognize the subspecies.

Both, our female and male specimens body size (1.4 mm, 1.26 mm, respectively) seem to be well below the species range when compared with the measurements reported by Wilson & Yeatman (1959) for specimens from the United States (total length: females 1.7–2.5 mm; males: 1.4–2.3 mm). As found in the Tabasco material, males tend to be smaller than females.

The Tabasco specimens show consistent but slight differences when compared with illustrations of North American material. These differences, which include secondary sexual structures such as the male and female fifth legs, the smaller size, the relative length of the dorsal furcal seta, and the geographic isolation of the Mexican population (and probably that of Guatemala), seem to be enough evidence to justify the erection of a new subspecies of *O. labronectum.* Of course, further studies on comparative morphology and even interbreeding experiments should be carried out in order to determine the status of the neotropical populations of *O. labronectum.*

The species record permits a southward extension of the known latitudinal distribution of this species into the tropical zone of Middle America (17°N), from the subtropical Florida area (30°N). It also represents a modest northwards range extension from the two localities in which it was recorded in two localities of Guatemala, Los Amates (15°16′N, 89°05′) and Puerto Barrios (15°43′N, 88°36′W), both close to the Gulf of Honduras, on the Atlantic coast (Juday 1915). The present record consolidates the regional distributional range of this species in the region (Fig. 14).

The present record of *O. labronectum* represents the first report of a freshwater representative of the family Centropagidae in Mexico (see Suárez-Morales & Reid 1998). *Osphranticum labronectum* can be collected in littoral areas, contrasting with

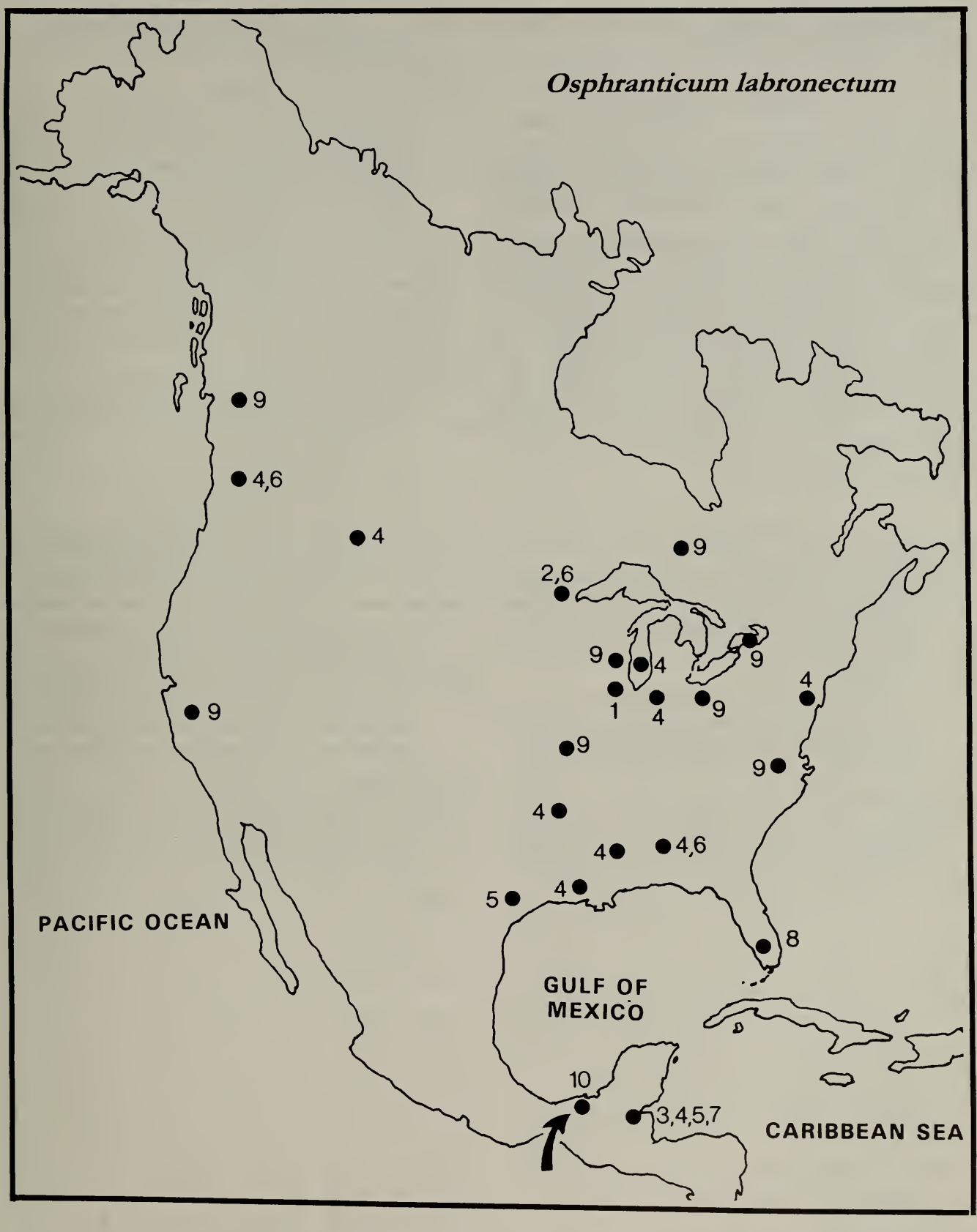


Fig. 14. Records of *O. labronectum* and authors reporting the species from different areas of North America. 1. Forbes (1882); 2. Herrick (1895); 3. Juday (1915); 4. Marsh (1933); 5. Wilson & Yeatman (1959); 6. Dussart & Defaye (1983); 7. Reid (1990); 8. Reid (1992); 9. other records from data of the Wilson Copepod Library, Washington, D.C.; 10. record in this paper (arrowed).

the diaptomid calanoid copepods which tend to prefer open waters.

Acknowledgments

We thank Manuel Elías-Gutiérrez, I. Castellanos, and C. Curiel ECOSUR-Chetumal, for collecting these samples at Tabasco. This work is part of the postgraduate project supporteed by CONACYT by the first author to survey the freshwater copepod diversity of the Mexican state of Tabasco. Sampling was supported by ECOSUR. Janet Reid kindly provided relevant literature from the Wilson Copepod Library. Frank Ferrari made useful comments on the morphology of the species.

Literature Cited

Bayly, I. A. E. 1992a. The non-marine Centropagidae. Guides to the Identification of the Microinvertebrates of the Continental Waters of the World. SPB Academic Publishers, The Hague, The Netherlands, 30 pp.

———. 1992b. Fusion of the genera *Boeckella* and *Pseudoboeckella* (Copepoda) and revision of their species from South America and sub Antarctic islands.—Revista Chilena de Historia Natural 65:17–63.

De Guerne, J., & J. Richard. 1889. Revision des calanides d'eau douce.—Mémoires de la Société Zoologique de France 2:53–231.

Mrázek, A. 1901. Süsswassercopepoden.—Ergebnisse der Hamburger Magelhaensischen Sammelreise 1892–93, 2:1–29.

Reid, J. W. 1990. Continental and coastal free-living Copepoda (Crustacea) of Mexico, Central America and the Caribbean region. Pp. 175–213 *in* D. Navarro & J. G. Robinson, eds., Diversidad Biológica en la Reserva de la Biosfera de Sian Ka'an, Quintana Roo, Mexico. CIQRO/ University of Florida, Mexico, 471 pp.

———. 1992. Copepoda (Crustacea) from fresh waters of the Florida Everglades, U.S.A., with a description of *Eucyclops conrowae* n. sp.—Transactions of the American Microscopical Society 111:229–254.

Reid, J. W., & R. M. Pinto-Coelho. 1994. An Afro-Asian continental copepod, *Mesocyclops ogunnus,* found in Brazil; with a new key to the species of Mesocyclops in South America and a review of intercontinental introductions of copepods.—Limnologica 24:359–368.

Sars, G. O. 1863. Oversigt af de indenlandske ferskvandscopepoder.—Forhandlinger i Videnskabsselskabet i Kristiania. 1863:212–262.

Suárez-Morales, E., & J. W. Reid. 1998. An updated list of the freshwater copepods of Mexico.—Southwestern Naturalist 43:256–265.

Williamson, C. E. 1991. Copepoda. Pp. 787–822 *in* J. H. Thorp & A. P. Covich, eds., Ecology and classification of North American freshwater invertebrates, Academic Press Inc., San Diego, 911 pp.

Wilson, M. S., & H. C. Yeatman. 1959. Free-living Copepoda. Pp. 735–861 *in* W. T. Edmondson, ed., Ward's & Whipple's Freshwater biology, John Wiley & Sons, Inc., New York, 1248 pp.